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Ashton B. Carter

Emerging Themes in Nuclear Arms Control

IN RETROSPECT THE ARMS CONTROL IDEAS described in the 1960 *Dædalus* volume seem obvious, like all deep ideas. According to the *Dædalus* authors, nations in military competition will normally be able, after some searching discussion, to agree to change their military preparations in ways that advance the security of both. Agreement can result when each side abandons hope that it will gain advantage in some military arena through all-out competition, yet fears the other might. Such instances of reciprocal fear will be quite common, since war is an uncertain business and most nations are conservative in their approach to it.

Agreement can also result from a determination not to let anything but a genuine clash of basic interests lead to war. (True clashes of basic interests, it was understood, will lead to deliberate war.) Potential triggers of inadvertent war will also be common in military competitions, since getting in the first blow in war usually carries substantial advantages for one reason or another, technical or psychological. Thus, even in a confrontation where neither side wants to press the issue to the point of war, neither side wants to be behind the other in its preparations either, and so each inadvertently hastens the other forward toward the war neither wants. Finally, in still other instances mutual restraint might save the parties money or face in peace, or lives in war, without otherwise materially affecting their military standoff.

In the sense intended in this essay, arms control is more than diplomacy. It involves more than the exchange of views on security

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affairs, the stating of intentions and fears, the giving of reassurances. Arms control agreements require the parties entering into them to make concrete changes in numbers and types of military forces, in their command and control systems, in their deployments, and in their tests and exercises. In this way desired features of the military relationship are "engineered into" the forces and cannot be changed as quickly as intentions. The true intellectual challenge of arms control is to translate desired security principles into concrete engineering principles for the forces.

The basic notions of arms control, as sketched above, are quite general and elastic, but they have received rather narrow application over the thirty years since the publication of the *Dædalus* issue which described them so well, and which this essay commemorates. Most arms control thinking—and practice—has been dedicated to nuclear forces rather than to conventional forces; to strategic nuclear weapons rather than to tactical nuclear weapons; and to the numbers and types of nuclear weapons rather than to their deployments, modes of operation, tests, and exercises. In fact, it is not going too far to say that arms control has evolved only a single truly powerful engineering principle, namely, that strategic nuclear arsenals should be physically able to survive first strike. This single principle will not carry us very far into the future, as we shall see.

The new and fluid world ushered in by Mikhail Gorbachev will put arms control ideas to a much broader test. The pending START agreement could well lead to a follow-on START II agreement that will essentially put arsenal vulnerability to rest as a problem for US-Soviet nuclear arms control. What tasks will then be left for strategic arms control? Tactical nuclear weapons—short-range missiles, artillery shells, and probably surface naval weapons—will likely be eliminated or withdrawn to bases in the US and Soviet homelands. What arms control ideas will govern nonstrategic weapons? The Conventional Forces in Europe (CFE) talks mark a number of departures for arms control. They concern themselves, first, with nonnuclear forces, for which stability is a poorly defined concept; second, with the security interests of many more than two nations; and third, with the deeply political issues of the new Europe. Meanwhile, the nuclear forces, actual and potential, of France, Britain, and China; of Israel, India, and Korea; of Japan and Germany; and of a growing number of other nations will demand the attentions of arms control. Finally, chemical and biological weapons, ballistic missiles, and other fearsome and high-tech weapons await their turn at the table.

All these military arenas call for new arms control ideas of a kind that have not been called forth by the Cold War nuclear confrontation. The intellectual challenge, to repeat, is to discover the engineering principles—if such exist—that will make these many and diverse national arsenals around the world reflect in themselves a stable international security.

This essay will concentrate on nuclear weapons, and on two areas of conceptual innovation that will be needed for nuclear arms control in the coming decades. The first need is to identify types or ingredients of strategic stability—and, thus, objectives of negotiation—besides simply assuring hefty retaliation to a first strike. The second need is to develop a consistent outlook on limited nuclear use, and the arms control principles that go with it. The first area of innovation involves mostly the strategic forces; the second involves mostly the tactical forces.

This essay will not succeed in fully formulating the "engineering principles" that should guide future nuclear arms control, but it will sketch the lines along which further thought is needed. The speculations made here assume no reversal of the Cold War thaw, a more or less straight-line projection of several trends in evidence today, and no major wars. The period of our interest begins about ten years from now, when current negotiations and unilateral redeployments will have run their course. It ends about thirty years from now when, one supposes, the second thirty-year commemoration of the 1960 *Dædalus* issue will take the next step. Many of the measures identified for control of nuclear weapons in the following pages can be carried out unilaterally as well as by agreement: arms control and military planning spring from the same security objectives, as the authors of the 1960 *Dædalus* issue prescribed.

STRATEGIC NUCLEAR WEAPONS: BEYOND SIMPLE ASSURED RETALIATION

One "engineering principle" has virtually monopolized arms control thinking and practice: the principle that strategic nuclear arsenals should be made capable of assured retaliation to first strike.[1] So much is this the case that in the public speeches of negotiators, the editorial pages of thoughtful newspapers, and the analyses of deterrence "theorists," strategic stability is virtually synonymous with this simple form of arsenal survivability. Light, nationwide antiballistic missile (ABM) systems are destabilizing; so are the SS-18 and the MX, and multiple-warhead missiles generally. Silo basing is bad; submarine basing is good. Cruise missiles and bombers, being "slow flyers," are fine. These are the simple verities upon which thirty years of strategic arms control have been largely based. Indeed, one is tempted to say that ensuring heavy retaliation to first strike was the *only* specific engineering principle, or negotiating objective, distilled from the broad claims made in 1960 that arms control is a powerful tool to complement force planning and diplomacy.

Let us now suppose that follow-on agreements to START result in US and Soviet strategic arsenals that are drastically reduced (to one-third or one-fourth their current size) and in continuing limitations on active defenses. A wide variety of technically feasible and socially acceptable basing modes for strategic weapons will provide simple assured retaliation when confronted with such small "threats."[2] Indeed, the number of weapons that targeteers can devote to an attack on the opposing side's strategic arsenal will decline faster than the totals since command and control, conventional forces, and war-supporting industry targets, together with a "strategic reserve," also make demands on the available inventory of warheads. Supposing that arms control results in such reductions over the next ten or twenty years, and that the superpowers invest in survivable basing, what will be left for strategic arms control to do? What should arms control focus on once vulnerability is a "solved problem?"

Assured retaliation the right way: restoring the balance between survivability and control

Both superpowers have taken shortcuts in their pursuit of assured retaliation. To guarantee that retaliation to a first strike would not only be certain, but efficient and thoroughgoing, the strategic forces have adopted operations plans that call for an unwinding of the forces according to a carefully sequenced but inflexible script. The ideal of a deterrent that could calmly sit out a crisis without taking any actions that might aggravate it, and that could ride out a first strike until the enemy had done his worst and then wait patiently for the president or his successors to deliberate, has been sacrificed in favor of sheer weight of retaliation.

Take the US bomber force, for example. Only a fraction of this force stands alert in normal times. Posturing the entire force to deliver its full weight of retaliation would therefore entail a transition to a higher alert state in the midst of a deepening crisis. If a Soviet missile attack occurred, the bombers would have to receive a warning within minutes of the launch in order to escape safely from their bases. If the attack were real, the bombers and their refueling tankers would fly north, awaiting a message ordering them to continue to their targets. If this order was not received within six or eight hours, the aircraft would have to seek out surviving airbases to refuel and "reconstitute." This is a messy prospect at best, and commanders know it. They are likely to inform the president that they cannot guarantee the effectiveness of the bomber force unless he makes a decision to retaliate within several hours of attack. (They might even be tempted to *assume* he will retaliate within hours, in which case they will see no point in spending money in advance trying to make reconstitution a *less* messy affair.)

Furthermore, if one looks closely at the communications systems that would carry the strike message to the bombers as they headed north, one finds that they would become progressively fewer and less reliable as the hours went by after Soviet attack and bomber takeoff; the president would also be informed that his orders were more likely to be received if transmitted soon after the attack was launched. If the bombers planned to attack relocateable targets in the Soviet Union (an advertised capability), then they would have to depend on targeting information that would quickly become outdated from sensors that might not themselves survive for long. The bombers' way would be eased if their flight over the Soviet Union were preceded by a missile attack on Soviet air defense batteries. So perhaps retaliation plans should give emphasis to the added efficiency to be gained by launching such missiles soon after the attack on the United States. In fact, the silo-based missile force would be most effective if "launched under attack," before attacking Soviet missiles even arrived.

Thus, in many subtle and not so subtle ways, through the cumulative effect of a host of seemingly unavoidable technical and especially *operational* details, hasty and rigid timelines have crept into the workings of the strategic forces. Survivability has been made contingent, not absolute. The survivable basing modes that result from a true thaw in US-Soviet relations and deep cuts in strategic arsenals, if these occur, should be capable of what might be called "dumb rideout": their ability to retaliate effectively should be independent of warning or other information, independent of what other forces in other basing modes are doing, and independent of time. Arms control should concern itself more with the *operational* implications of assured retaliation than it has in the past.

Survivability for command and control. It has finally become widely recognized that a distinct, and in the current strategic arsenals, more serious, form of vulnerability resides in the command and control systems.[3] Efficient postattack working of the strategic command and control system is more contingent, and applies more time pressures, than the working of the weapons themselves. There are many facets to command and control vulnerability, and it presents a much more complex picture than arsenal vulnerability.[4] Most warning and communications systems would function for only a short time after commencement of an attack. But identifying a legitimate chain of command might take many hours. *Mundana,* like backup power generators and command aircraft running out of fuel, and *exotica,* like blackout and electromagnetic pulse, all apply constraints to the system and, ultimately, to decision makers.

The same arms control reductions that improve arsenal survivability can improve command and control survivability. But more attention should be paid in future arms control thinking to the distinctive problems of command and control. Distinct engineering principles for negotiators could follow from such new attention: for example, bans on earth-penetrating warheads designed to attack underground command bunkers; bans on depressed-trajectory missile flights (also useful for bomber survivability); limitations on antisatellite systems capable of attack on the warning and communications satellites in high orbits; bans on sea-launched cruise missiles that could detonate on near-coastal command and control centers with no warning; and missile warning sensors cooperatively emplaced in one another's missile fields.

More restrictive enabling devices. With the pressure on command and control survivability eased, it will finally be possible to reduce drastically the number of groups of people who have the physical capability to use nuclear weapons.[5] This physical capability has been dispersed at command levels below the president (who has the sole *authority* to order use of nuclear weapons) to guarantee that it would survive attack. The clearest example of such dispersal can be found in the missile submarines, which are capable of launching their missiles without external aid through the collective action of a number of crew members. The future goal should be that only the highest civilian and military leaders possess the wherewithall to "enable" military operators to employ nuclear weapons. Such enabling should also be selective, capable of being addressed individually to small subsets of the entire arsenal; contingent, restricting use to authorized targets only; and reversible, so that weapons can be locked up again after once being unlocked.

No technological hurdles stand in the way of these objectives. Such controls will not only make the superpowers' arsenals safer, but will serve as an example to other nations that come to possess nuclear weapons in coming decades. Though more restrictive controls need not be the subject of arms control agreements, some sharing of technical and procedural innovations among countries would be beneficial.

Avoiding breakout. The very first major strategic arms control treaty to follow the 1960 *Dædalus* volume, the 1972 Antiballistic Missile (ABM) Treaty, preoccupied itself with a problem that will grow more pressing as strategic arsenals are reduced in size and, perhaps, in variety. US negotiators of the ABM Treaty resolved that simply banning deployments of ABM systems (in excess of a 100-interceptor token maximum) would not protect US security adequately. They sought to write provisions into the treaty that would prohibit the Soviet Union from positioning itself to deploy an ABM system quickly. Accordingly, the ABM Treaty extends its prohibitions to the development and testing of ABM systems as well as their deployment, creating a lengthy "buffer" between the time a party decides to withdraw from the Treaty and the earliest time it could put into place a strategically meaningful ABM defense. The precise rules governing what types of development and testing activities are permitted and which are prohibited by the ABM Treaty have been a source of controversy since President Ronald Reagan launched the Strategic Defense Initiative. But the underlying idea that arms control treaties need to contain buffers against rapid breakout and compromise of the treaty's stabilizing effect is unimpeachable.

The importance of the buffer concept will grow if arms control agreements are reached that "really matter." Consider, for example, a post-START agreement limiting US and Soviet ICBM and SLBM warheads to a total of 1,000 on a side, and further limiting flights of test missiles. Strict rules on development and testing of missile defenses will need to accompany this offensive agreement. Neither party would wish the other to be able to put into place within a short time a defense capable of intercepting as few as several hundred of its missile warheads. Responding to such a breakout deployment would entail rapid production of offensive missiles, which would be difficult if production lines were closed down in anticipation of an end to arms racing and rapid fielding of penetration aids, whose development would be retarded by the ban on missile flight tests.

In addition to a buffer against defensive breakout, buffers will be required against any form of offensive breakout that would threaten the survivability of a basing mode "protected" by the arms control agreement. If a side thought it was guaranteed survivability of silo-based missiles under the agreement, for example, it would need to limit the other side's capability to increase rapidly the number or warhead carriage of its missiles. The completed INF agreement and the draft START agreement, with their intrusive on-site inspection provisions, have begun setting limits on activities that precede deployment.

Targeting and minimum deterrence. Strategic weapons have always been aimed at three categories of targets: nuclear forces and their associated national political and military command and control, conventional forces and their associated field command and control, and war-supporting civil infrastructure like transportation, fuel, and weapons-manufacturing installations. The implicit goal of strategic arms control has been to eliminate the first category from the target lists. Counternuclear targeting has not been very promising for either side over the three decades since the 1960 *Dædalus* volume because the other side has always maintained a substantial arsenal that could not be destroyed through such targeting. In the United States presidents have consistently permitted strategic targeting to be done under "guidance" that assigns high priority to attack on Soviet nuclear forces, while systematically depriving the military of the weapons to do the job and pursuing arms control agreements that have the express aim of making such targeting ineffective.

If strategic arsenals are consistently reduced over coming decades to levels approaching one-fourth their current size, there will come a point at which the dedication of "scarce" weapons to a manifestly ineffective attack on enemy strategic forces will seem impractical even to the targeting staffs. Counternuclear targeting will probably be eliminated from the "requirements" that specify how many nuclear weapons the military needs, and that, in part, justify the much larger size of today's strategic arsenals. The question, "How much is enough?" will then be answered by reference to the second and third target categories. A plausible recent estimate numbers the targets in these categories at about 2,000.[6]

Some advocate deeper cuts still, to a "minimum deterrent" of a few hundred warheads deliberately targeted in such a way as to punish an enemy by attacking his cities rather than to remove him as a military power by attacking his military forces. It is well known that minimum deterrence in this sense is morally objectionable. Such an arsenal can only invite violation of the strictures on proportionality and discrimination that Western thinkers long ago established to counter the natural temptation, having decided to resort to force, to use all the force at hand. The force used should be proportional to the stakes of the conflict, that is, to the good the conflict will do. And force should be applied in such a way as to spare innocent life. With nuclear weapons humankind came into such a lavish endowment of destructive power that the setting of limits became urgent.

Minimum deterrence heads in the other direction by removing nuclear weapons completely from any military context. It is less appreciated that minimum deterrence presents practical problems as well. Military organizations have resisted the minimum deterrence mission; they want to have missions they can believe in, missions that have military rather than terroristic objectives.

Once vulnerability is a solved problem and opposing nuclear forces are stricken from the targeting requirements, one of the more interesting themes of arms control will be the answer negotiators give to the question, "How much is enough?" and the degree of public support for a military deterrent as opposed to a much smaller, "minimum," psychological deterrent.

The problem of non-Soviet nuclear powers. So much of the intellectual buttressing of strategic arms control has been tailored to the US-Soviet Cold War nuclear competition that one can find very little guidance in the thinking of the past thirty years as to what is likely to be the most urgent problem of US arms control in thirty years: the engineering of stable deterrent relationships with non-Soviet nuclear powers. It is, for this discussion, not important which nations might be involved. They range from Libya to Japan. Nor is it necessarily the case that the United States will need to formalize its relationship through arms control with all nations that have the capability of strategic attack on it. The British and the French have long had such capability, and Americans have felt no need to regulate it.

There is, of course, the possibility that international action will forestall proliferation of nuclear weapons. The problem will come with nations that *do* obtain nuclear weapons and that clearly threaten strategic use against the US homeland. We can take it for granted that the United States, with its heavy investments in the technology of survivability, will make its arsenal resilient to attack by any group of nations. The problem will be *their* survivability. The United States and the Soviet Union went through an ugly period, from roughly the early 1950s until the early 1960s, when it was just plausible that by attacking first, one side could meaningfully limit the damage from the other's retaliation. Only when it became clear that the other side's retaliation could be blunted, but not eliminated, did it become palatable to settle for mutual vulnerability through arms control.

It seems likely that the United States will pass through a period in the future with most non-Soviet nuclear powers when it has the capability to mount an entirely or nearly disarming strike against them. These other nuclear powers, knowing of this American capability, might take the same dangerous steps the United States and the Soviet Union took to guarantee survivability of their deterrent forces: dispersed authority to launch, dangerous or provocative alerting procedures, short operational timelines, and so on. Since some of these nations might be quite hostile to the United States, and might have populations that relish their capability to do nuclear damage to this wealthy superpower, America will not willingly relinquish its first-strike advantage.

But at a certain point the United States will probably judge the dangers of threatening vulnerability to be greater than the dangers of conceding survivability to the nation concerned. At this point, it would be wise to enter into arms control agreements that increase the safety of a mutual hostage relationship that has become unavoidable.[7]

NONSTRATEGIC NUCLEAR WEAPONS: USABILITY AND UNUSABILITY

At the same time as the 1960 *Dædalus* issue went to press, another decade-long American effort on a different kind of control over nuclear weapons was reaching completion: a decade of weaving tactical nuclear weapons into the arsenals and operations plans of the military organizations. At the beginning of the decade, nuclear weapons had been viewed largely as a means of bringing devastation to the enemy homeland, eliminating the enemy's capacity and will to wage war rather than his forces on the battlefield—in short, as strategic weapons. During the 1950s American military organizations increasingly sought to bring nuclear weapons to bear on the front, not just in the rear. The objective of this intensive program of technological innovation was to make nuclear weapons usable for military purposes, meaning usable for purposes short of destroying the other side's society and inviting similar destruction of one's own society, for purposes more akin to the uses of conventional military force—in short, for "limited nuclear war."

By the end of the 1950s nuclear weapons existed in a variety of yields and delivery modes. Their dimensions and weights were greatly reduced, and they incorporated safety and security features that allowed them to be deployed with ordinary military units. Accordingly, by the early 1960s they were in the day-to-day possession of nearly every branch of the armed services, despite a brief battle early in the decade for civilian (i.e., Atomic Energy Commission) "custody." By various diplomatic agreements and "two-key" military agreements, US nuclear weapons were closely associated with allied forces, if not in their outright possession. Nuclear weapons had been designed to be delivered by aircraft, by artillery, by mortars, by torpedoes, by all sorts of rockets, and by teams of soldiers as "atomic demolition munitions." This decade-long development was epitomized by the Davy Crockett, a shoulder-carried nuclear bazooka.

The efforts to make nuclear weapons "usable" in practical military circumstances occupied a substantial part of the effort of scientists working on nuclear weapons in the 1950s. The usability objective had been strongly favored by, among others, J. Robert Oppenheimer. Oppenheimer is well known for his opposition to the development of the "Super" hydrogen bomb. It is less well appreciated that Oppenheimer was a strong supporter of the tactical nuclear weapons program. The famous 1949 report of the General Advisory Committee of the Atomic Energy Commission, chaired by Oppenheimer, on whether to proceed with a crash program to develop the Super, contained the following paragraph:

> TACTICAL DELIVERY. The General Advisory Committee recommends to the Commission an intensification of efforts to make atomic weapons available for tactical purposes, and to give attention to the problem of integration of bomb and carrier design in this field.[8]

To Oppenheimer the Super represented a major step forward for the posture of massive strategic use of nuclear weapons championed by General Curtis LeMay and Secretary of State John Foster Dulles, which he thought completely unusable for any morally justifiable military purpose. His opposition to this strain of thinking was as important in his 1949 opposition to a crash program to develop the Super as any technical doubts about the feasibility of thermonuclear explosives. In a letter to James B. Conant written shortly before the special meeting of the General Advisory Committee produced its famous report in opposition to the Super, Oppenheimer wrote: "What concerns me is really not the technical problem. . . . It [the Super] seems likely to me even further to worsen the unbalance of our war plans."[9] The unbalance to which Oppenheimer referred was the tendency to base American plans for nuclear use upon a massive strategic bombing campaign patterned on the World War II bombing of Japan and Germany rather than upon tactical engagements with enemy forces.

These two threads, the "usable" and "unusable," in US operational planning have tensely coexisted ever since they were both brought to full realization in the operating commands, a process that was essentially complete by the time the *Dædalus* issue went to press. Neither thread ever clearly established itself as preeminent, let alone exclusive, in the ensuing thirty years. The result was, in a sense, the worst of both worlds: the United States maintained a huge retaliatory force for strategic deterrence that few pretended could serve any military role except retaliation to massive attack. It also maintained the declared intent and some of the plans, procedures, and forces for tactical use of nuclear weapons, but with inadequate emphasis on achieving true battlefield advantage through nuclear use, limiting collateral damage to morally and politically acceptable levels, or terminating nuclear hostilities before they could escalate beyond any reasonable bounds of war—emphases that would logically need to go with tactical intent. The usable and unusable forces were in fact linked in the European theater by a deliberately and carefully maintained powder train designed to make it all too likely that employment of nuclear weapons for "limited" purposes would be incompetent, inconclusive, and uncontrolled; they would ultimately provoke a much larger unleashing of the unusable strategic arsenal.

The result of the dispute between advocates and foes of limited nuclear use has been the kind of compromise found frequently in American political life. The United States never really deployed the kinds of nuclear weapons, or made the kinds of operations plans, that would have rendered tactical use efficacious or safe in the standard scenarios of major conventional war in Europe, Korea, or the Middle East. But neither did it renounce tactical use. This compromise is likely to grow more awkward in coming years because the changes affecting nonstrategic forces are even more dramatic than those affecting strategic forces.

It is likely that in ten years time, if current trends persist, the only US nuclear weapons deployed outside national territory will be carried by submarine-launched ballistic missiles and, possibly, submarine-launched cruise missiles, carrier-based aircraft, and NATO tactical aircraft. All other nonstrategic nuclear weapons will be eliminated or withdrawn to US territory through a mixture of unilateral military decisions, international political pressures (especially in Europe), and arms control. The trend, in short, is toward undoing the integration of nuclear and conventional forces avidly pursued in the 1950s and half-heartedly maintained ever since.

The United States will need to decide what the remaining nonstrategic weapons are for, to give the military guidance about how they should plan to use them, and to decide what arms control principles ought to apply to them. In the most superficial sense, nuclear weapons would seem to be a convenient adjunct to conventional military forces. A single nuclear weapon can destroy a bridge, airfield, radar, ship, compact armored formation, command center, or munitions factory a quarter of the globe away in half an hour at a very reasonable cost. The difficulties with limited nuclear use are fourfold.

The first problem is that nuclear weapons tend to destroy everything around the target as well as the target itself. Outside of the Cold War context of major superpower war in Europe, the moral and political hazards of using so much force at once are forbidding. A nuclear force attempting to take limited usability seriously would have to select targets whose military value was high, but which were not in populous areas; to draw up operations plans that obtained decisive military results with very few weapons; to deploy low-yield weapons with "clean" nuclear designs to minimize fallout; to fuze for high airburst over area targets; and perhaps to develop earth penetrating warheads for point targets. A tactical nuclear force would have to show that, operating under these constraints, it could still produce better battlefield outcomes at less cost than conventional forces.

The second problem with using nuclear weapons for military purposes is that the other side might have them too. The other side might respond with, let us say for the moment, an equal number of their nuclear weapons on a target set comparable to ours. Now the questions are: Did anyone profit militarily from this exchange? Was the result asymmetrical? One can ask the same of chemical weapons of course, and even of conventional weapons. Neither side used chemical weapons in World War II because neither could see how the ensuing chemical exchange would do more harm to the opposing side than to themselves.

The third problem with limited nuclear use is that it might escalate to much larger strategic use, so large that the ensuing destruction would be out of proportion to the original conflict. A usable arsenal would, accordingly, need command and control systems that strictly limited the latitude of the troops using nuclear weapons through, for example, Permissive Action Links and other devices for controlling use. The side initiating supposedly limited use would furthermore need to make clear to the enemy the purposes for its nuclear strike, the limitations it placed upon itself, and its plans to terminate nuclear hostilities after achieving its military objectives.

The fourth and final problem with having the United States or anyone else use, or even maintain forces with the open intent to use nuclear weapons for tactical purposes is the likelihood that it would erode the forty-five-year taboo on nuclear use. Scholars argue about whether nuclear weapons have prevented a world war since 1945, and about whether the avoidance of nuclear war in particular has been advanced by this or that type of weapon deployment. These arguments can never be resolved. But the fact remains that, for whatever reason, the tens of thousands of nuclear weapons in existence over several decades since 1945 have never been used, not one of them. And this fact alone probably constitutes a bulwark against nuclear use, a bulwark that has nothing to do with the intricacies of deterrence but instead with habits of mind and moral norms built up over a generation. The next user of nuclear weapons in anger would attract the opprobrium of the whole world and would bear responsibility for any subsequent wider weakening of the taboo on nuclear use. For the United States, surely no limited military objective would be worth that price.

The logic that should govern US nonstrategic nuclear forces is now clear. One should first try to identify scenarios of nuclear use in the service of military objectives in the new Europe, the Persian Gulf, Korea, or elsewhere that satisfy the first three criteria. It is far from obvious that such scenarios exist. If they do, they likely do not require nuclear weapons to be stored outside of the United States in an immediately ready condition, where they are subject to terrorism, seizure by "host" nations, or "use 'em or lose 'em" pressures on local commanders. Instead, all nonstrategic nuclear weapons can be withdrawn to the United States. This nonstrategic nuclear force should furthermore be entrusted to a special "expeditionary force" that, like the special forces, is organizationally segregated from the conventional and the strategic nuclear forces to emphasize its entirely different purposes and to avoid the dangerous ambiguity with which nonstrategic forces have been treated in the past. Technically, the nonstrategic nuclear weapons should be designed to move rapidly, to minimize collateral damage insofar as possible, and to operate under extremely strict command and control from Washington. To fall short in meeting the first three criteria is to create a dangerous illusion of usability.

This is the picture of future US nonstrategic nuclear weapons that emerges from applying the first three criteria. If this picture seems implausible, then the fourth criterion overwhelmingly recommends a very different course. That course is the elimination of nonstrategic nuclear weapons and the explicit renunciation of nuclear use for any other purpose than retaliation to nuclear attack upon the US homeland. In this course arms control for nonstrategic nuclear weapons ought to focus on the simple goal of eliminating them rather than rebasing them, restructuring them, or limiting their numbers.

* * *

A colleague and mentor who is always very wise in these matters used to propose the following definition of nuclear stability. In an idle moment one future day the president of the United States asks the secretary of defense how many nuclear weapons the United States has of a certain type. The secretary of defense replies that he has never had occasion to learn the answer, but he will find out. He phones a few senior aides at the Pentagon. None of them knows even approximately how large the arsenal is, but they promise the secretary a prompt answer. The president's question is passed to a lower level of aides, where once again no one can answer it. The secretary of defense's embarrassment grows as the minutes tick by. Eventually someone in the bowels of the Pentagon or at a base somewhere is found who knows. Up the hierarchy of aides, all puzzled by this arcane inquiry, the answer is passed. After an hour or so the president gets his answer. *That*, said my colleague, is stability.

There is something to be said for this picture of stability. The apparent end of the Cold War unquestionably makes less urgent the kind of attention to engineering details of the nuclear forces—numbers and types of weapons systems—that has characterized arms control in the thirty years since the *Dædalus* issue. It is a welcome development if military confrontation, and with it arms control, assume a more modest place in international political life.

But the end of the Cold War also leaves the United States and the Soviet Union in possession of several tens of thousands of nuclear weapons. These are simply too dangerous to forget. It would be particularly inexcusable to cease the effort to shape these arsenals cooperatively at the very moment when their proper purposes must necessarily be changing radically, and when they should be logically changing too. It would also be inexcusable to neglect arms control at the very moment when the political atmosphere permits important steps toward safety to be taken. To do anything else would show too little respect for this powerfully destructive technology.

ENDNOTES

[1] In practice, of course, two other principles have been active, namely, that there ought to be rough equality or "parity" of the superpower arsenals, and that the overall number of nuclear weapons ought to be reduced. But parity is more in the nature of a political constraint on arms control than an objective in itself, and reductions for their own sake, while perhaps having an intuitive wisdom, are regarded as lacking a rigorous link to stability.

[2] Where qualitative rather than quantitative changes in the threat might make the crucial difference in the survivability of a basing mode (as with, for example, locating submarines or mobile missiles so they can be efficiently targeted) we shall simply assume that some combination of basing technology and arms control will ensure survivability. This is a big assumption, and one that cannot really be justified, since thirty years is much too far into the future to make predictions in the field of target acquisition technology.

[3] The pioneering studies in command and control vulnerability are John D. Steinbruner, "National Security and the Concept of Strategic Stability," *Journal of Conflict Resolution* 22 (September 1978): 411–428; and Steinbruner, "Nuclear Decapitation," *Foreign Policy* 45 (Winter 1981–1982): 16–28.

[4] See Ashton B. Carter, "Assessing Command System Vulnerability" in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, eds., *Managing Nuclear Operations* Washington, D.C.: (The Brookings Institution, 1987), chap. 17.

[5] It has long been true that only groups of military personnel, and not individuals, have been physically able to use nuclear weapons. Group use involves various collective actions, voting schemes, and possibilities for vetoes.

[6] Michael M. May, George F. Bing, and John D. Steinbruner, *Strategic Arms Reduction* (Washington, D.C.: The Brookings Institution, 1988).

[7] An alternative to conceding vulnerability (besides preventively attacking the offending nation before it had completed its nuclear deployments) is the erection of near-perfect continental defenses against missile, air, and seacoast delivery of nuclear weapons to the United States. This alternative, however, does not look promising technologically.

[8] Herbert F. York, *The Advisors: Oppenheimer, Teller, and the Superbomb* (Stanford University Press, 1976), Appendix II, 155.

[9] Ibid., 55.